

## Modelling Urban Hinterland: The Case Study of Roman Palmyra

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The city of Palmyra is one of the first examples of a large urban centre whose prominence and wealth were based on specific economic activity not related to agriculture. Palmyra derived its wealth from long-distance trade, but even in the most prosperous city, which could levy significant income from taxes on the passing caravans, food security might not have been guaranteed by monetary resources. Given the distances involved and the cost of land-based transport of foodstuff through a desert, it is likely that the bulk of food necessary for the city population's survival had to be cultivated locally. Here, we evaluate the feasibility of feeding the population of Palmyra based on the carrying capacity of its hinterland. This calculation, in turn, places a hard limit on how big of a population could be sustained by the city's hinterland.

There are three steps in modelling hinterland productivity: 1. Establishing the study area, 2. Calculation of maximum possible yields and their translation into population size, 3. Calibration against climate models to evaluate the changes to the baseline productivity over time. We will use the example of Palmyra to discuss the methods involved in this research pipeline, their data requirements, limitations and robustness as well as the available data sources. While modelling hinterland land use and productivity enable establishing the maximum feasible population size of an urban centre it can also provide an insight into the sustainability of a food distribution system and its role in ensuring food security in marginal environments.